BROADCAST COMMUNICATIONS ENGINEERING
Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213

OCCUPIED BANDWIDTH STUDY
INTERMODULATION STUDY
HARMONIC CONTENT STUDY

FOR
K264CY, 100.7 MHz
K283CI, 104.5 MHz
St. Louis, MO.

PERFORMED 9/17/2021

BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213

PURPOSE OF THE TEST:

As outlined in the FCC's Code of Federal Regulations, all FM radio stations employing transmitters manufactured after January 1, 1960 must perform a "one time" check of their transmitter's performance to verify compliance of their emissions within the FM spectrum. The rules applying to these measurements are outlined in sections 73.317 and 73.1590 of the Code of Federal Regulations:

§73.317 FM transmission system requirements.

(a) FM broadcast stations employing transmitters authorized after January 1, 1960, must maintain the bandwidth occupied by their emissions in accordance with the specification detailed below. FM broadcast stations employing transmitters installed or type accepted before January 1, 1960, must achieve the highest degree of compliance with these specifications practicable with their existing equipment. In either case, should harmful interference to other authorized stations occur, the licensee shall correct the problem promptly or cease operation.

(b) Any emission appearing on a frequency removed from the carrier by between 120 kHz and 240 kHz inclusive must be attenuated at least 25 dB below the level of the unmodulated carrier. Compliance with this requirement will be deemed to show the occupied bandwidth to be 240 kHz or less.

(c) Any emission appearing on a frequency removed from the carrier by more than 240 kHz and up to and including 600 kHz must be attenuated at least 35 dB below the level of the unmodulated carrier.

(d) Any emission appearing on a frequency removed from the carrier by more than 600 kHz must be attenuated at least 43 + 10 Log10 (Power, in watts) dB below the level of the unmodulated carrier, or 80 dB, whichever is the lesser attenuation.

(e) Preemphasis shall not be greater than the impedance-frequency characteristics of a series inductance resistance network having a time constant of 75 microseconds.

§73.1590 Equipment performance measurements.

(a) The licensee of each AM, FM and TV station, except licensees of Class D noncommercial educational FM stations authorized to operate with 10 watts or less output power, must make equipment performance measurements for each main transmitter as follows:

(1) **Upon initial installation of a new or replacement main transmitter**.

(2) Upon modification of an existing transmitter made under the provisions of §73.1690, Modification of transmission systems, and specified therein.

(3) Installation of AM stereophonic transmission equipment pursuant to §73.128.

(4) Installation of FM subcarrier or stereophonic transmission equipment pursuant to §§73.295, 73.297, 73.593 or 73.597.

(5) Installation of TV stereophonic or subcarrier transmission equipment pursuant to §§73.669 and 73.1690.

(6) Annually, for AM stations, with not more than 14 months between measurements.

(7) When required by other provisions of the rules or the station license.

(b) Measurements for spurious and harmonic emissions must be made to show compliance with the transmission system requirements of §73.44 for AM stations, §73.317 for FM stations and §73.687 for TV stations. Measurements must be made under all conditions of modulation expected to be encountered by the station whether transmitting monophonic or stereophonic programs or providing subsidiary communications services.

(NOTE: All Electronic CFR rules updated January 2021)

BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213

On September 17, 2021 Broadcast Communications Engineering was contracted to conduct an Occupied Bandwidth Study, an Emissions measurement, and an Intermodulation Study on two translators in St. Louis, MO. New translator, K264CY operating on 100.7 Mhz was recently built under construction permit BNPFT-20180501AAX. A second translator, K283CI was already operating on 104.5 Mhz on the same tower. Due to the proximity of the two FM antennas construction permit BNPFT-20180501AAX requires a full Occupied Bandwidth Study including an Intermodulation Study to ensure all spurious radiations are contained within the FCC's required parameters.

This study will prove both translators achieve and exceed all requirements of sections **§73.317** and **§73.1590** by exhibiting the following:

1) Occupied Bandwidth is within the limits of section 73.317
2) Intermodulation limits are below the limits established in section 73.317
3) Harmonic content is below the limits established in section 73.317

Qualifications

Bobby J. Moore of Lebanon, MO conducted all tests and measurements. He has owned and operated Broadcast Communications Engineering since 1994. Bob holds FCC license #PG-17-27327 and is a member of St. Louis SBE Chapter 55. He has conducted these types of tests on dozens of FM and AM facilities throughout the mid-west. Many tests are a matter of record with the FCC in similar applications. He is very qualified to carry out these measurements.

Under the penalty of perjury all findings in this document are true and accurate to the best of my knowledge and ability.

The following equipment was used in performing the measurement:

Anritsu Model MS2721B Spectrum Analyzer; Serial #1018004
Copper Mountain S5045 Network Analyzer, Serial #20107482
Bird Model 4275-020 Variable RF Signal Sample
Wavetek Model 5202 60 Mhz to 122 Mhz tunable bandpass filter
RTL-SDR 88-108 Mhz FM Reject Filter

Method of Testing

All measurements were taken at the output of each transmitter. The Bird™ RF signal sample provides an in-line sample of the transmitter's RF output and was placed between the transmitter's RF output and the transmission line. This sampled feed was connected to the input of a spectrum analyzer. An unfiltered sample was taken when conducting occupied bandwidth measurements and when establishing reference levels. A Wavetek tunable bandpass filter was placed between the sample and the spectrum analyzer when measuring all in-band intermodulation products. The tunable filter attenuates everything except the frequency being measured to provide accuracy and to avoid overloading the input to the spectrum analyzer. The tuning of the pass-band filter was verified using a network analyzer before taking each measurement. An FM band reject filter was placed in line with the sample when frequencies below 80 Mhz and above 108 Mhz were being measured. All measurements are documented in the following exhibits.

BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213

Tests Conducted:

100.7 Occupied Bandwidth Study

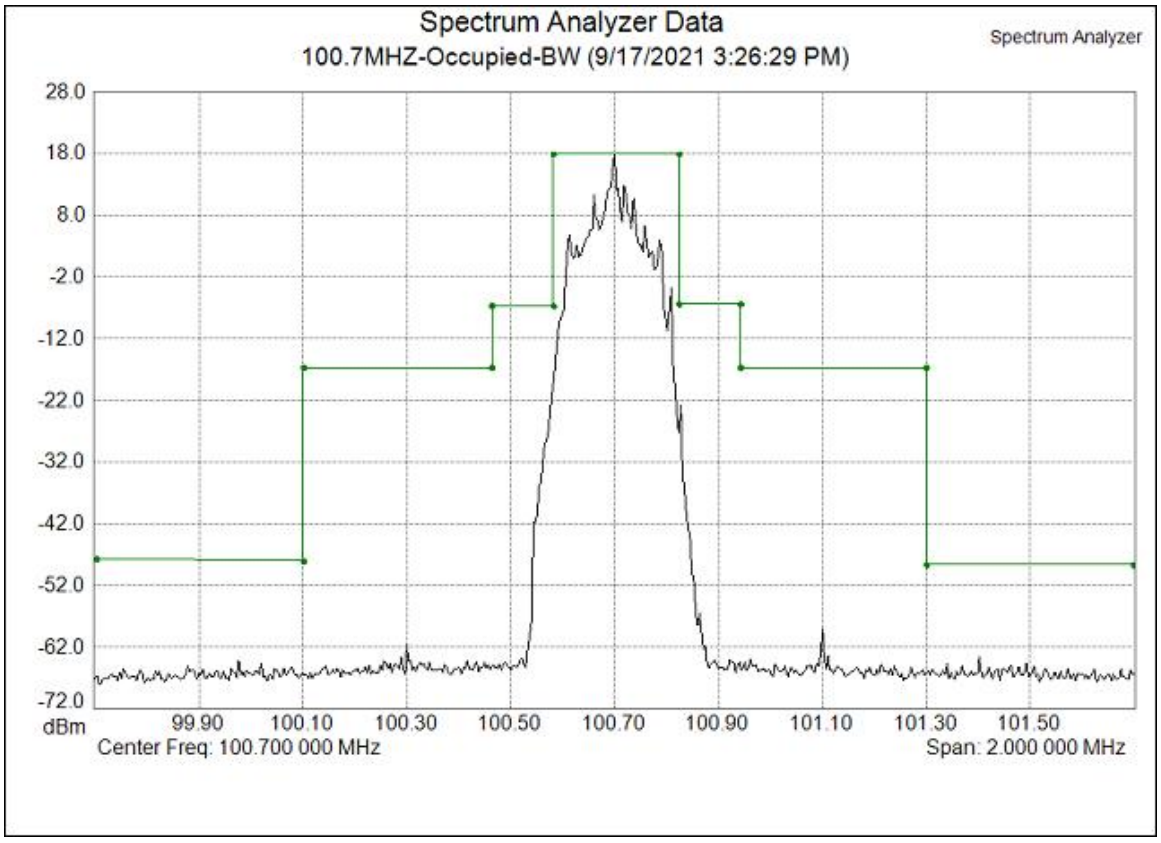


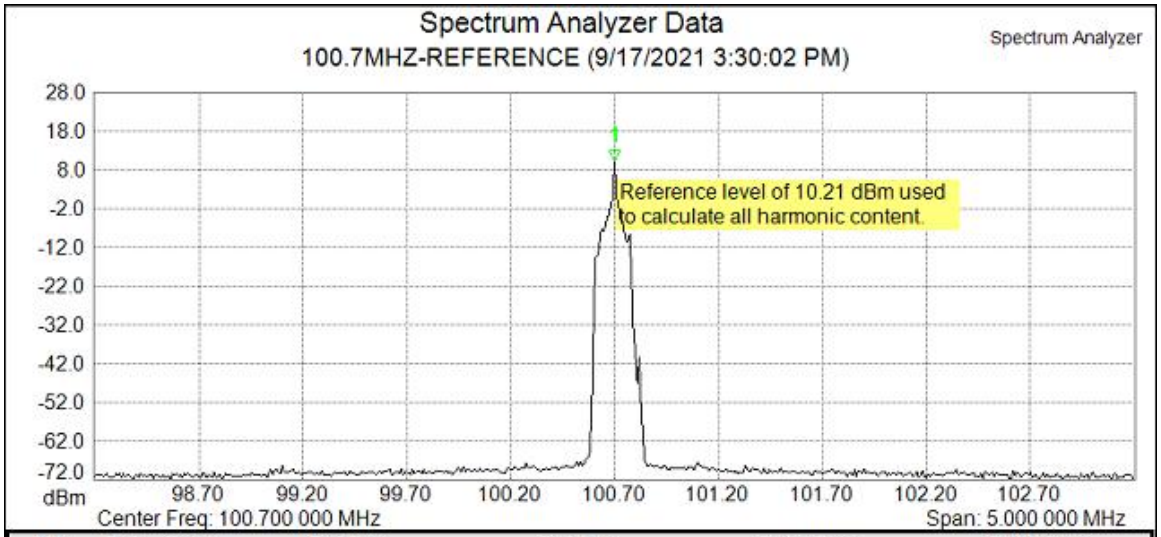
Exhibit demonstrating the 100.7 translator is operating within the required FM mask.

BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213

100.7 Reference Level



Mkr	Ref	Delta	Ref Freq	Ref Amp	Delta Freq	Delta Amp
1	■	□	100.700 0 MHz	10.21 dBm	--	--
2	□	□	--	--	--	--
3	□	□	--	--	--	--
4	□	□	--	--	--	--
5	□	□	--	--	--	--
6	□	□	--	--	--	--

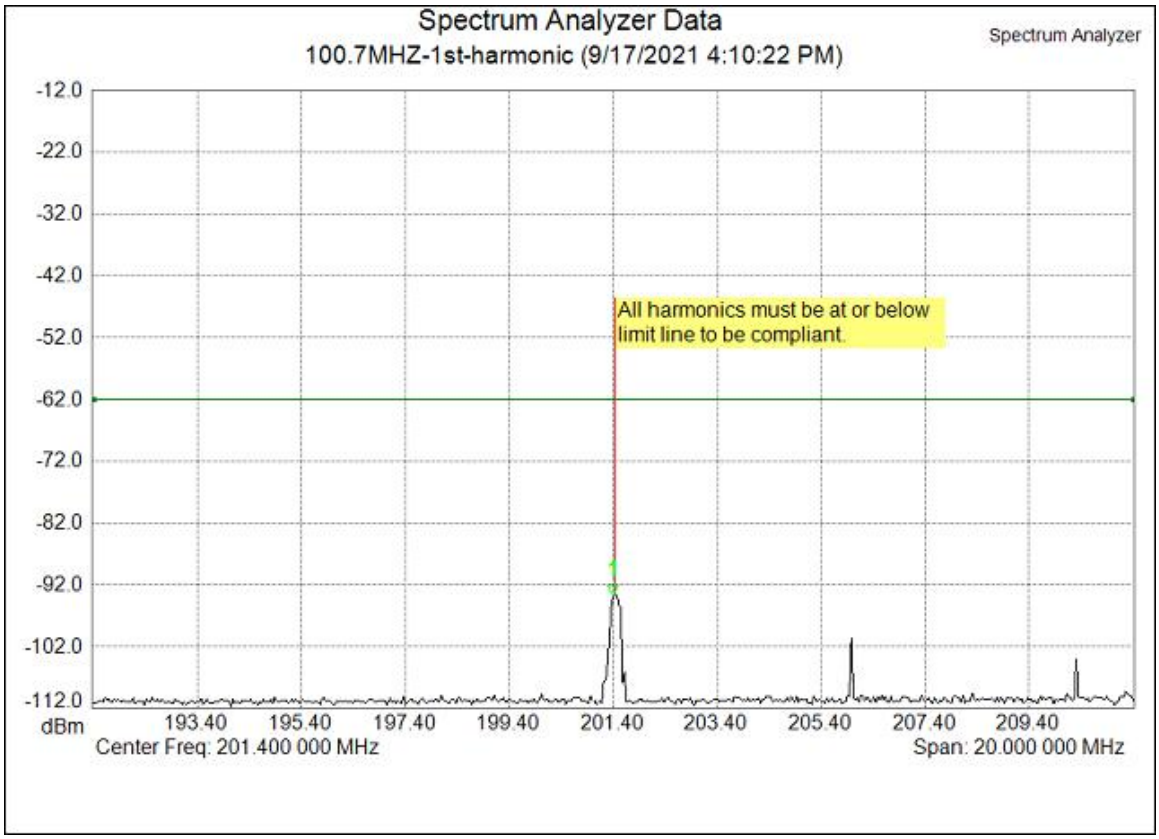
The level of 10.21 dBm is the reference level established for the measurement of all spurious radiation and harmonic content of the 100.7 transmitter. The power output of the 100.7 transmitter is 850 watts. Using the formula *43 + 10 Log10 (Power, in watts) dB* from CFR 73.317 it is established that all spurious radiation must be **72.3 db** below the referenced carrier level.

BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213

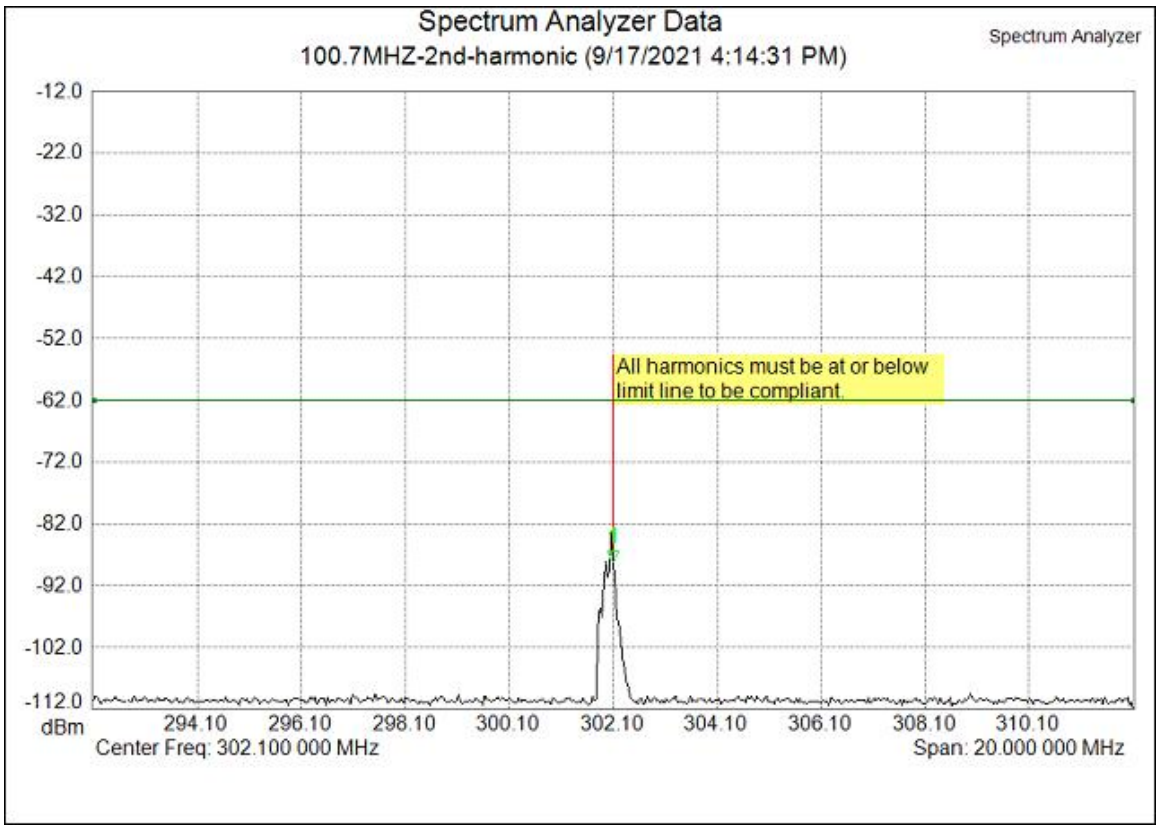
1st, 2nd, and 3rd Harmonics of the 100.7 transmitter



BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

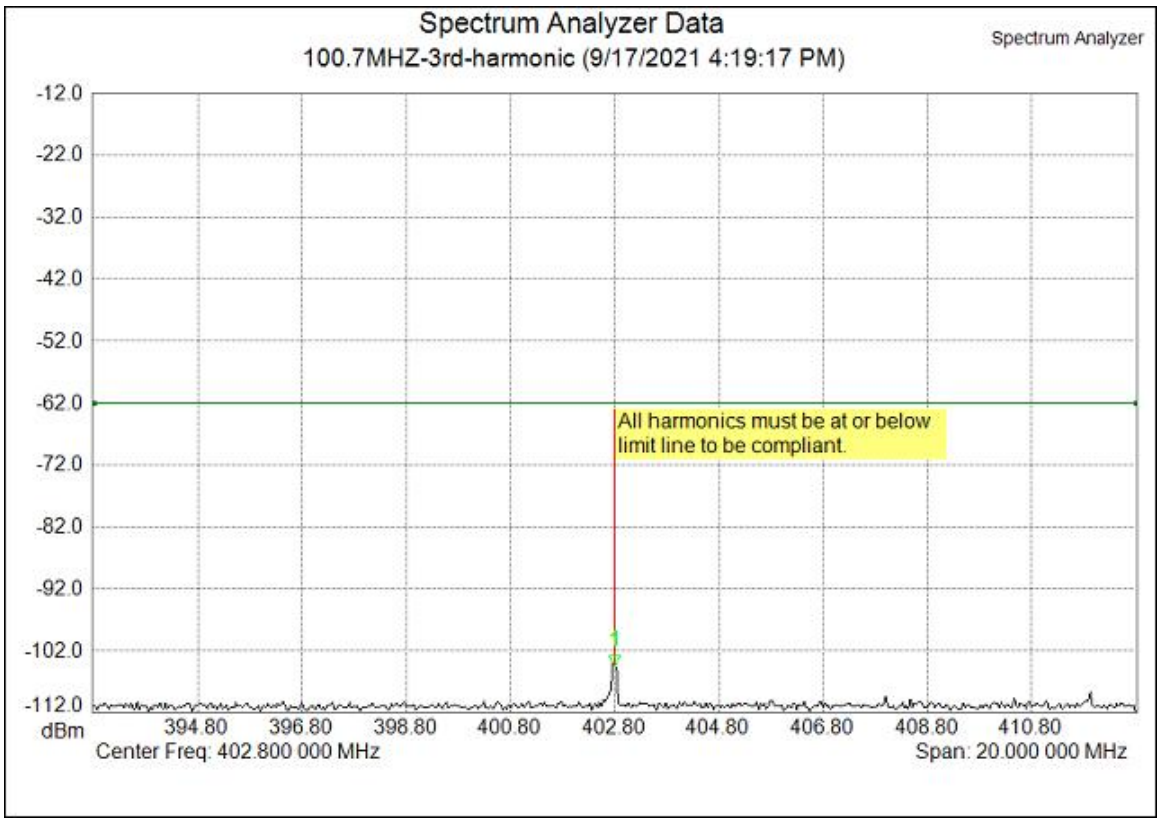
Telephone 417-718-5213



BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213



Exhibits demonstrating 1st, 2nd, and 3rd harmonics of the 100.7 transmitter's carrier are attenuated more than **72.3** db below the reference carrier level.

BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213

Intermodulation Study

The following results were derived when the frequencies of 100.7 MHz, 104.5 MHz were calculated for their intermodulation products. If a local station was detected on an intermodulation frequency it was omitted and not measured.

3rd Order Products:
96.9 MHz (local station nearby)
108.3 MHz

5th Order Products:
93.1 MHz
112.1 MHz

7th Order Products:
89.3 MHz
115.9 MHz

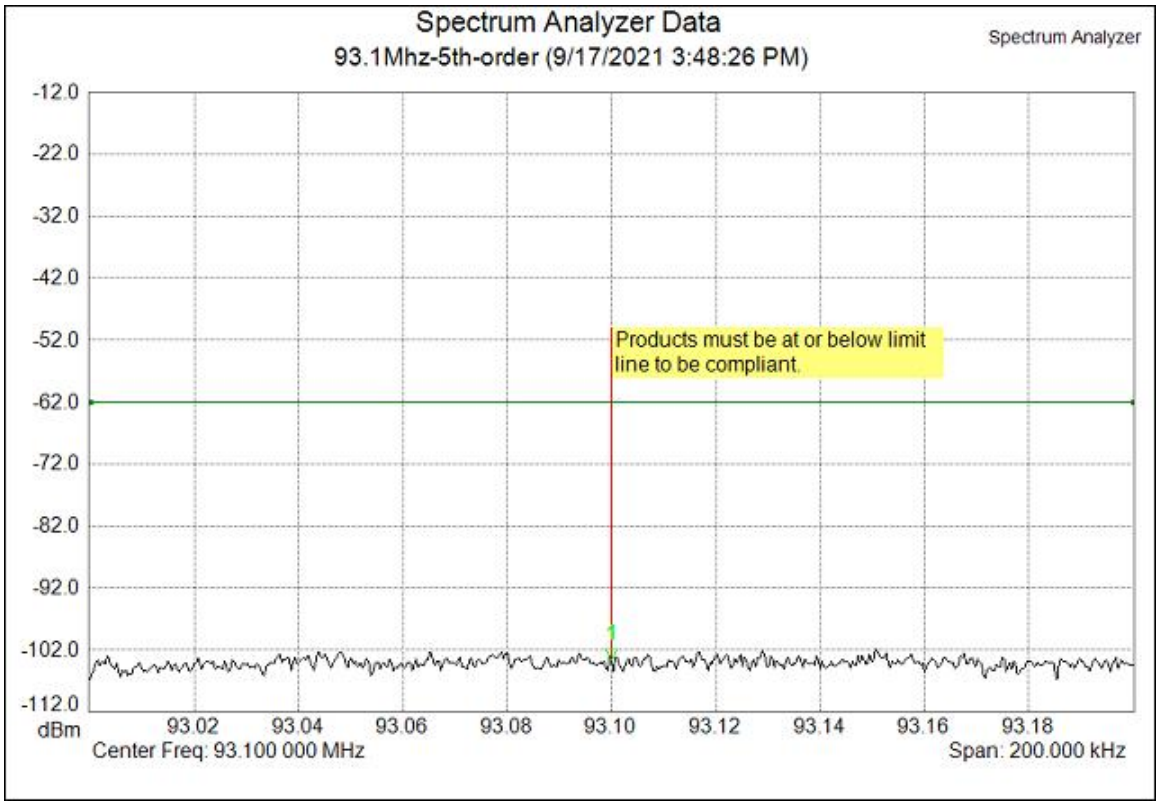
9th Order Products:
85.5 Mhz
119.7 Mhz

BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213

93.1 Mhz Intermodulation Product of the 100.7 Transmitter

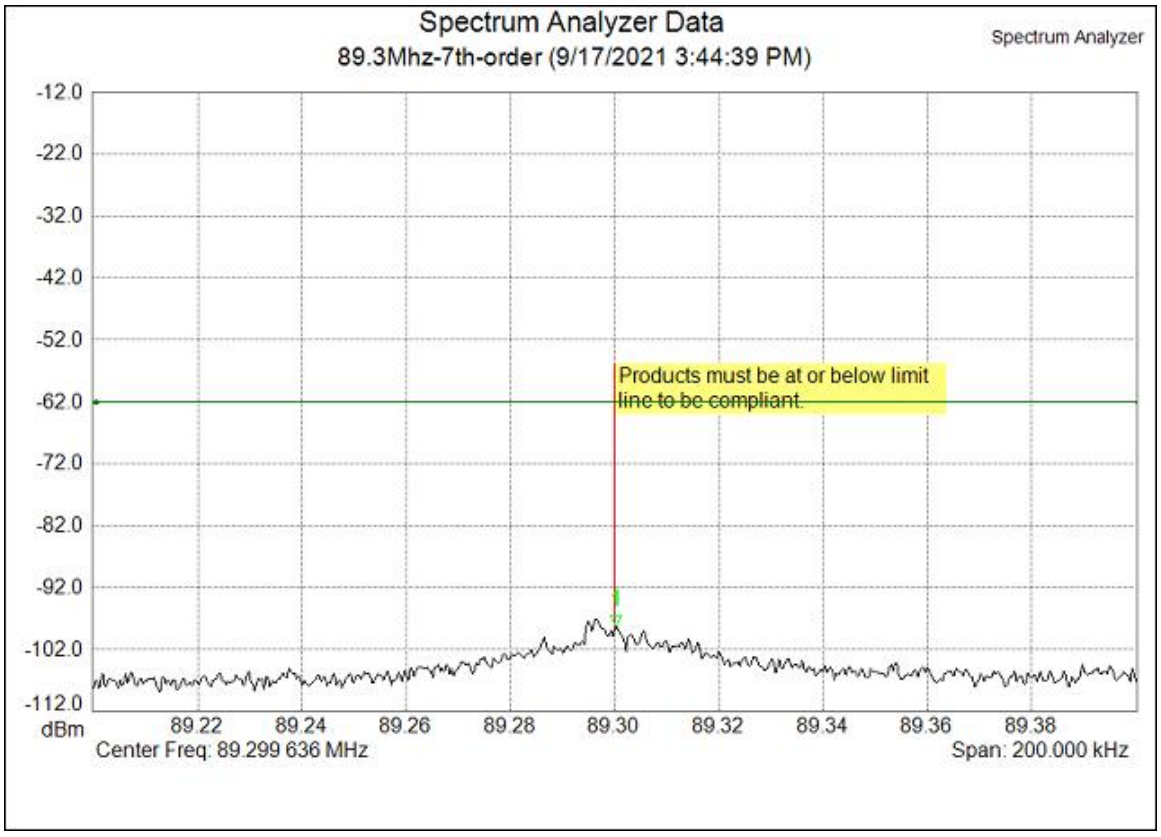


BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213

89.3 Mhz Intermodulation Product of the 100.7 Transmitter

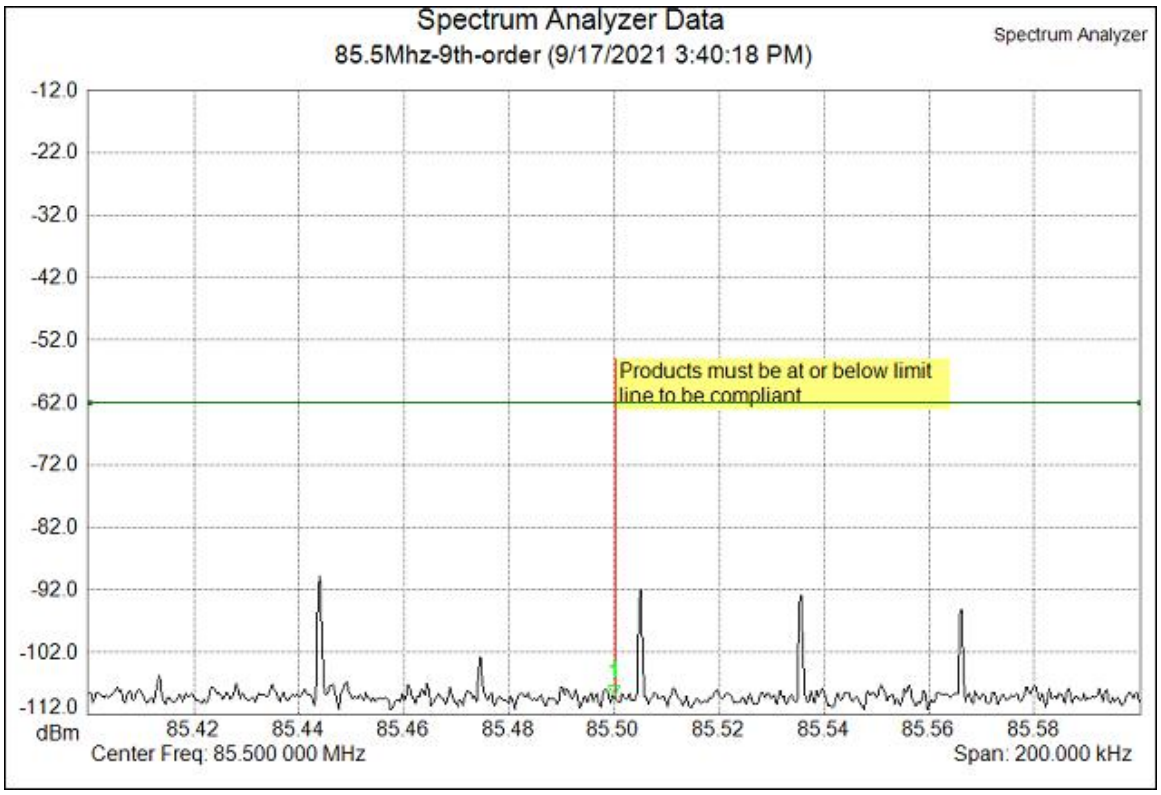


BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213

85.5 Mhz Intermodulation Product of the 100.7 Transmitter

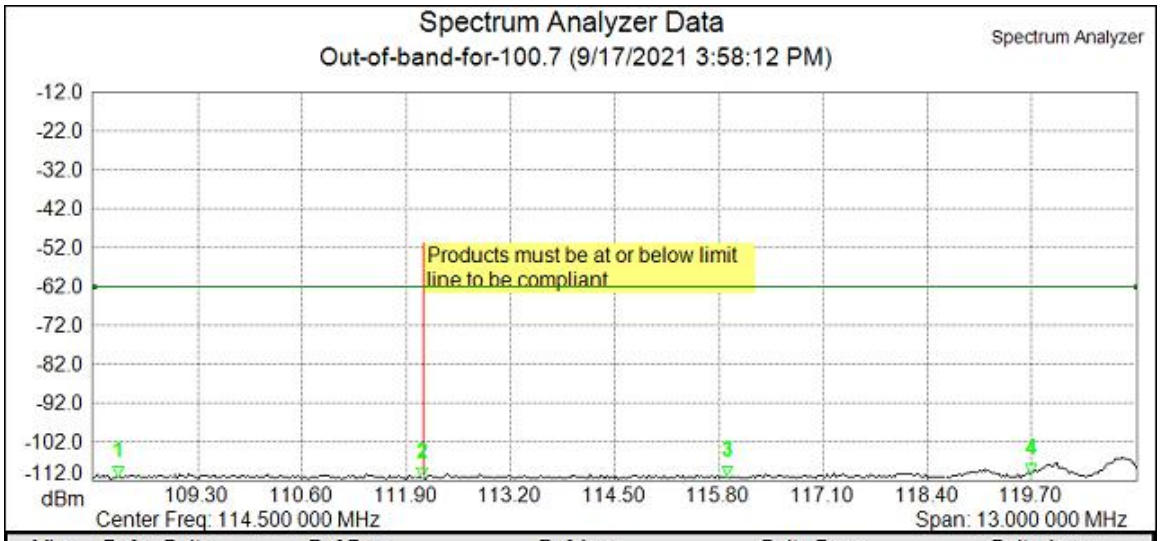


BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213

Out-of-band Intermodulation Product of 100.7 Transmitter



Mkr	Ref	Delta	Ref Freq	Ref Amp	Delta Freq	Delta Amp
1	■	□	108.300 0 MHz	-111.00 dBm	--	--
2	■	□	112.100 0 MHz	-111.35 dBm	--	--
3	■	□	115.900 0 MHz	-110.94 dBm	--	--
4	■	□	119.700 0 MHz	-110.35 dBm	--	--
5	□	□	--	--	--	--
6	□	□	--	--	--	--

Exhibit demonstrating all out-of-band intermodulation products are below the carrier reference level.

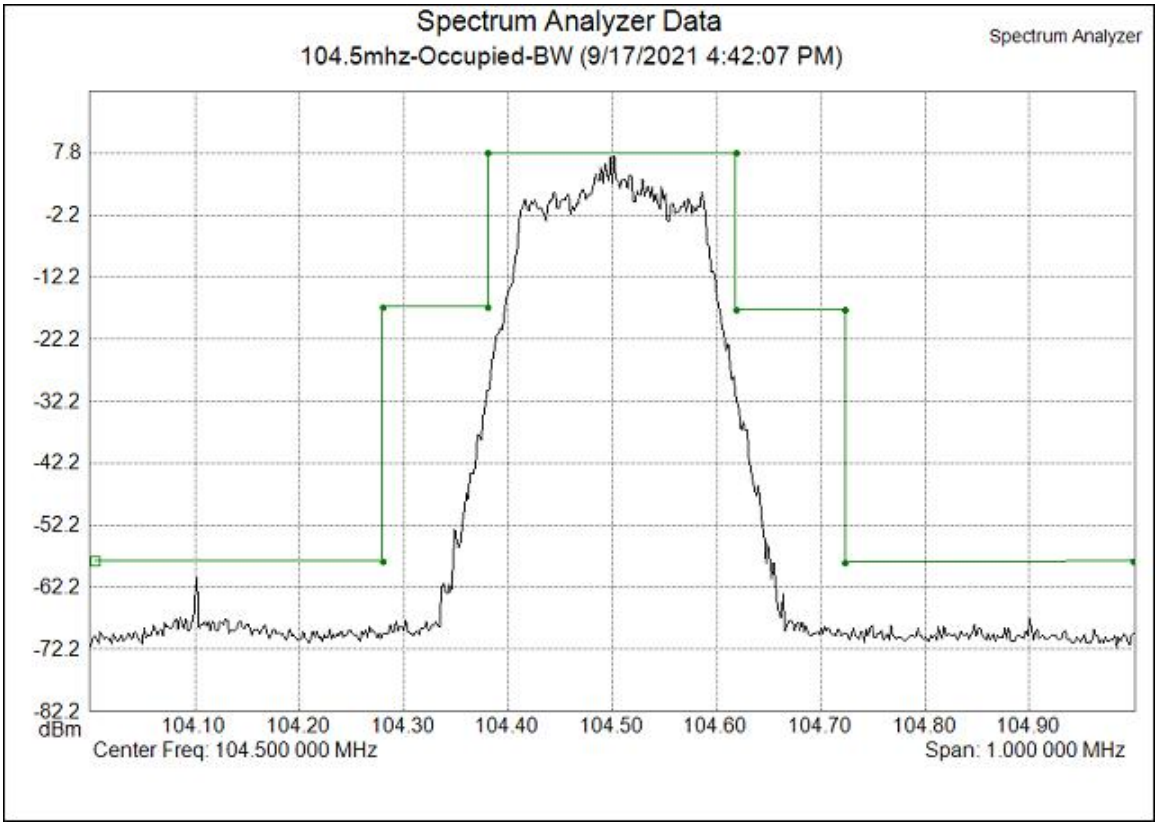
BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213

Identical measurements were conducted on the 104.5 Mhz translator to prove intermodulation products were within compliance at its output. The same measurement procedure as before was used to determine intermodulation content. The level of 2.6 dBm is the reference level that was established for the measurement of all spurious radiation and harmonic content of the 93.7 transmitter. The total power output of the 104.5 transmitter is 330 watts. Using the formula *43 + 10 Log10 (Power, in watts) dB* from CFR 73.317 it is established that all spurious radiation must be **68.2 db** below the referenced carrier level.

104.5 Transmitter Occupied Bandwidth Study

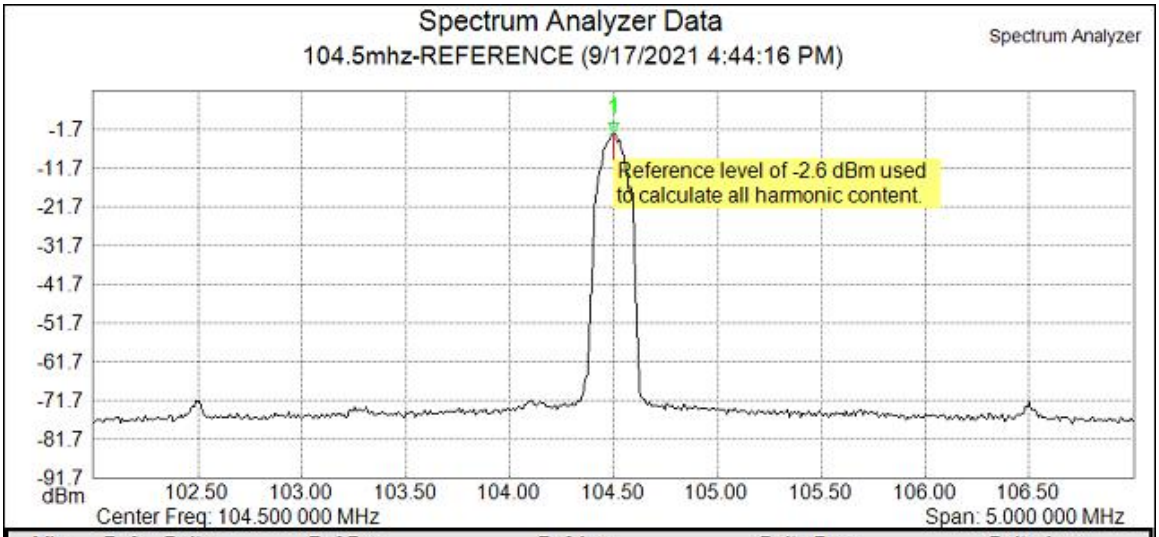


BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213

104.5 Transmitter Reference Level



Mkr	Ref	Delta	Ref Freq	Ref Amp	Delta Freq	Delta Amp
1	■	□	104.501 8 MHz	-2.57 dBm	--	--
2	□	□	--	--	--	--
3	□	□	--	--	--	--
4	□	□	--	--	--	--
5	□	□	--	--	--	--
6	□	□	--	--	--	--

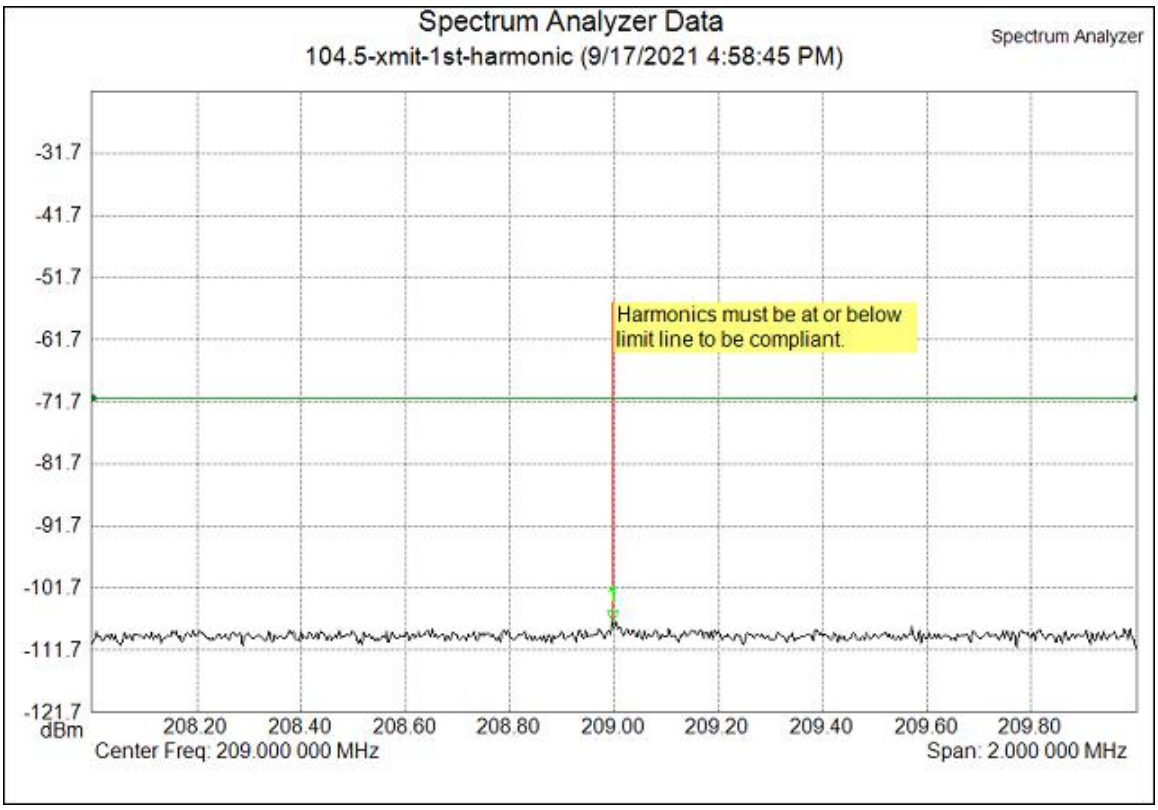
Exhibit establishing the 104.5 translator's reference level of -2.6 dBm. All harmonic and intermodulation content must be **68.2** dB below this level.

BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213

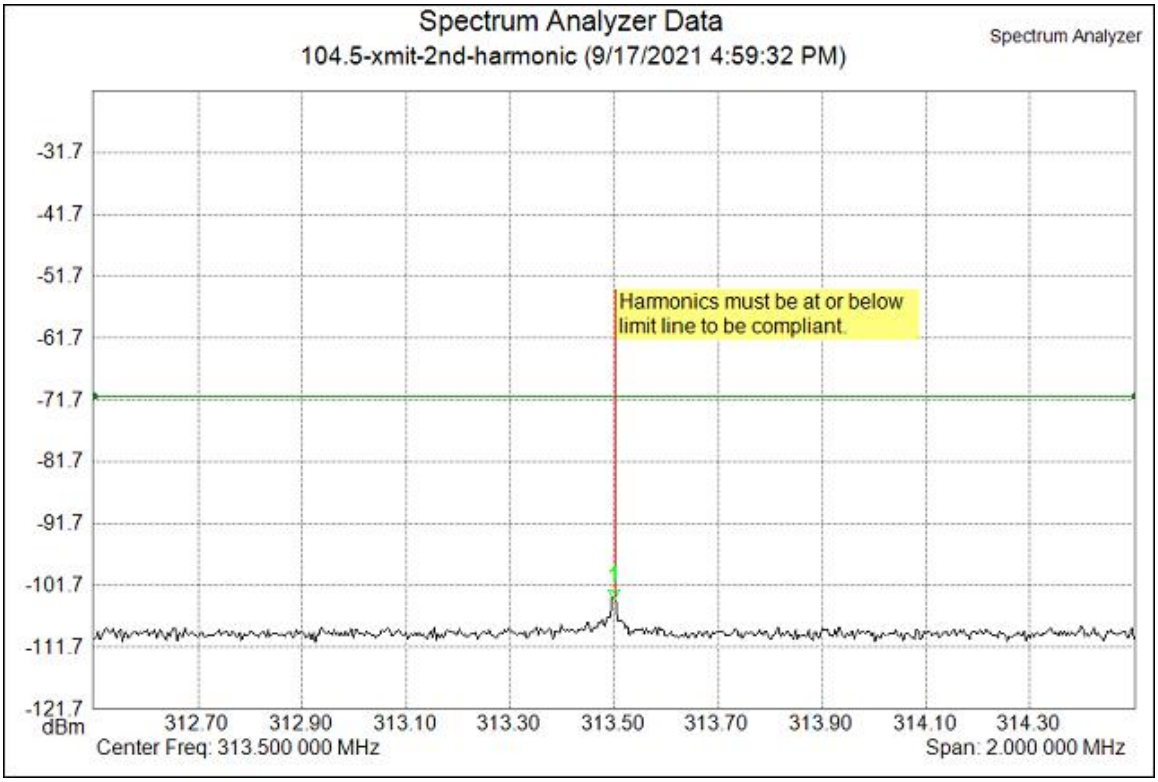
1st, 2nd, and 3rd harmonics of 104.5 Transmitter



BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

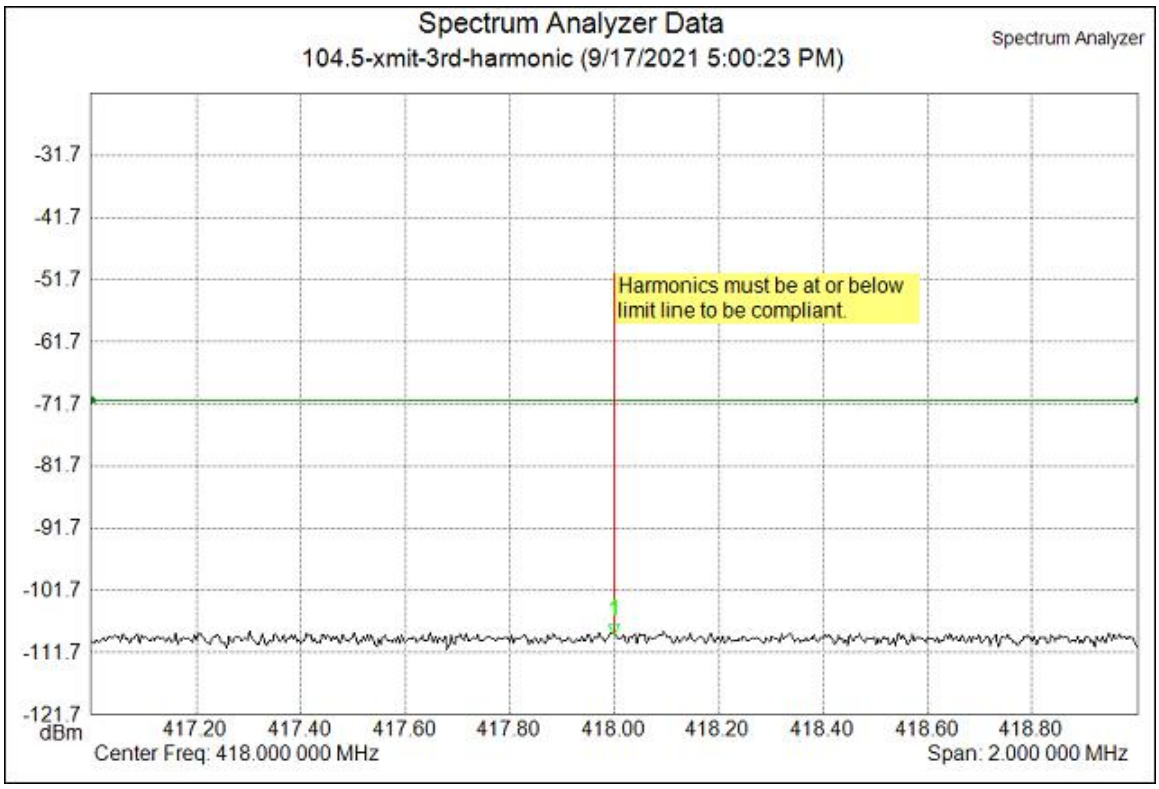
Telephone 417-718-5213



BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213

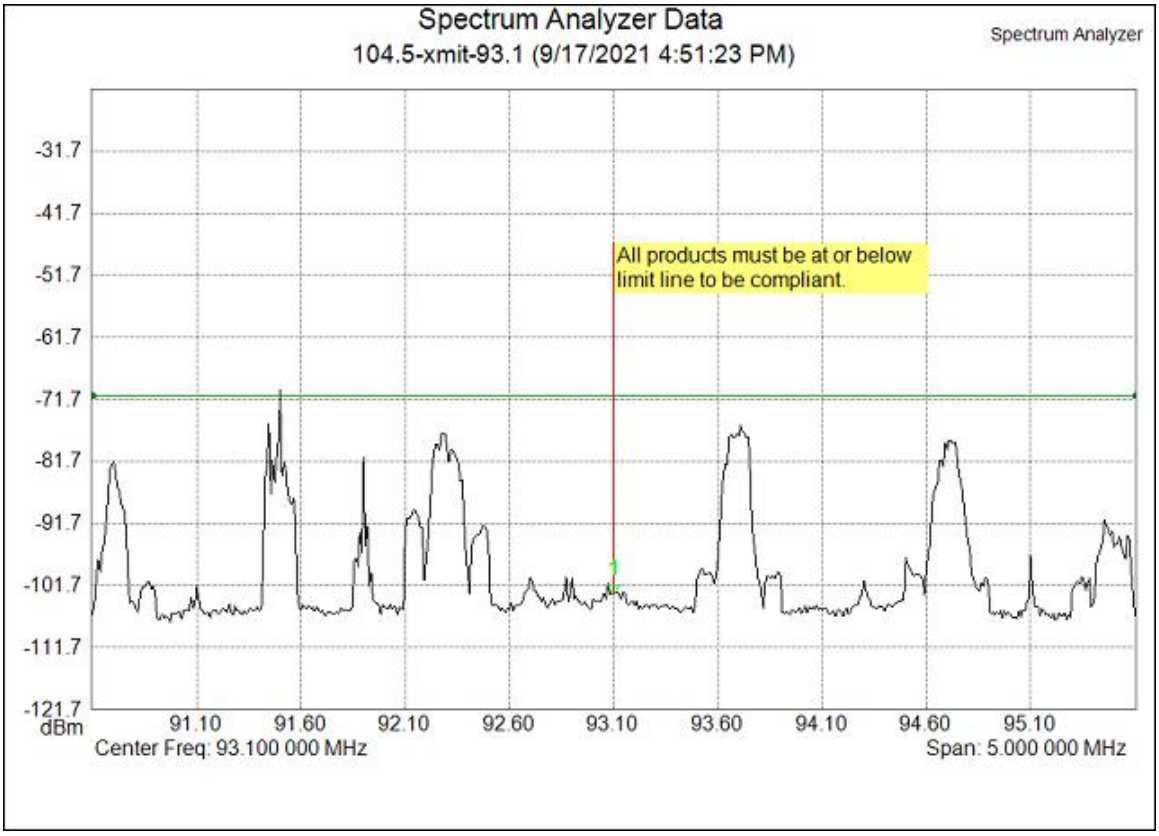


BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213

93.1 Mhz Intermodulation Product of the 104.5 Transmitter

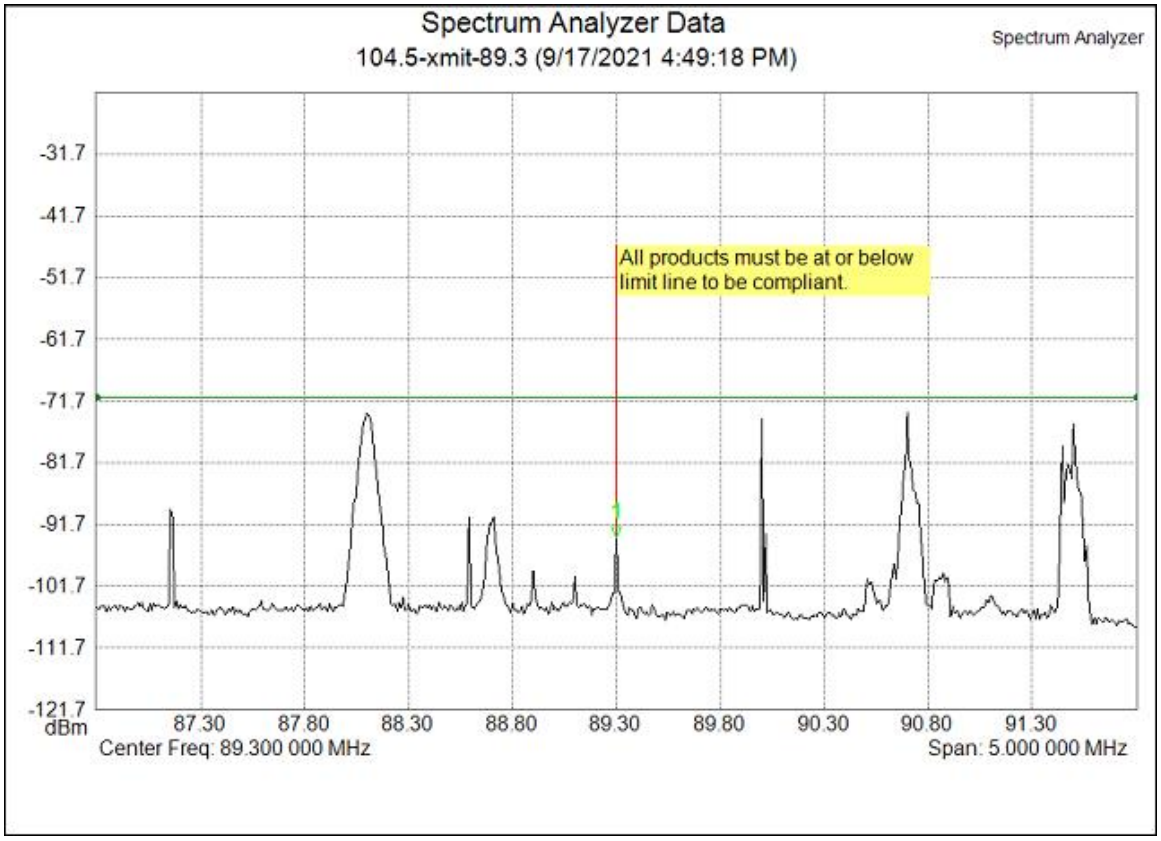


BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213

89.3 Mhz Intermodulation Product of 104.5 Translator

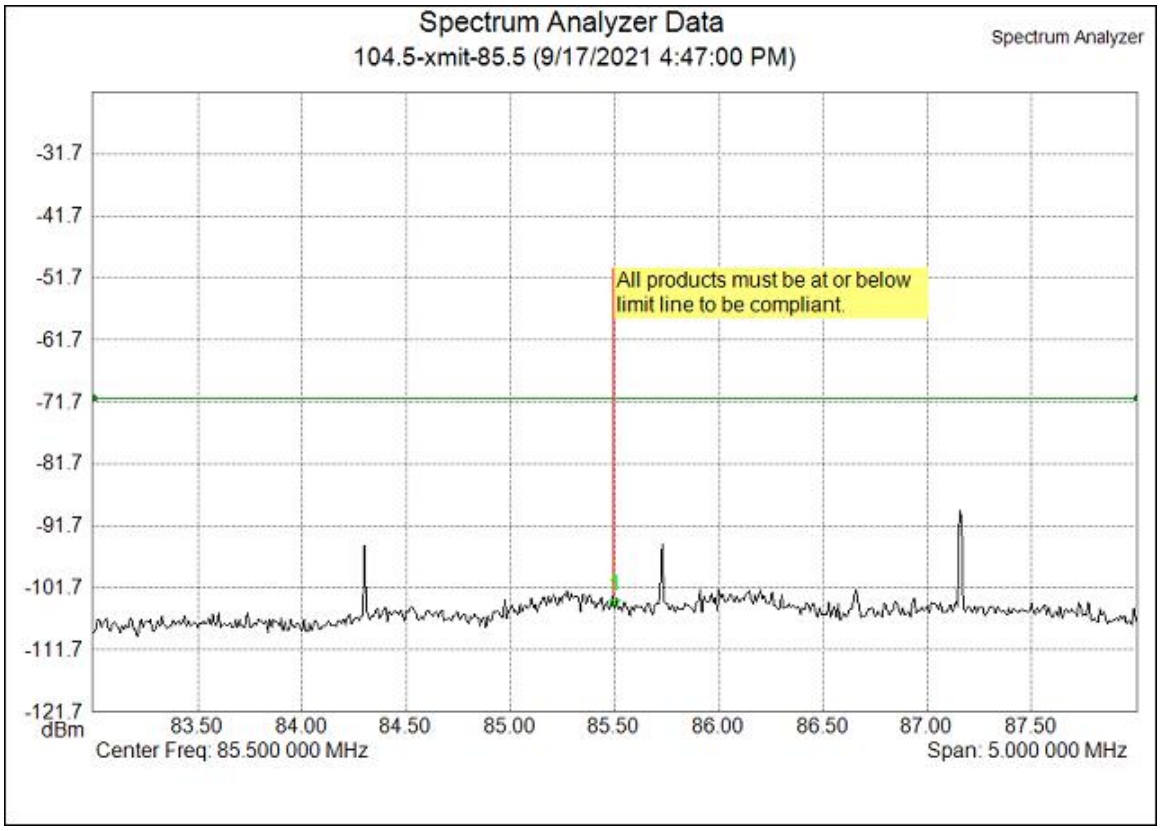


BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213

85.5 Mhz Intermodulation Product of 104.5 Translator

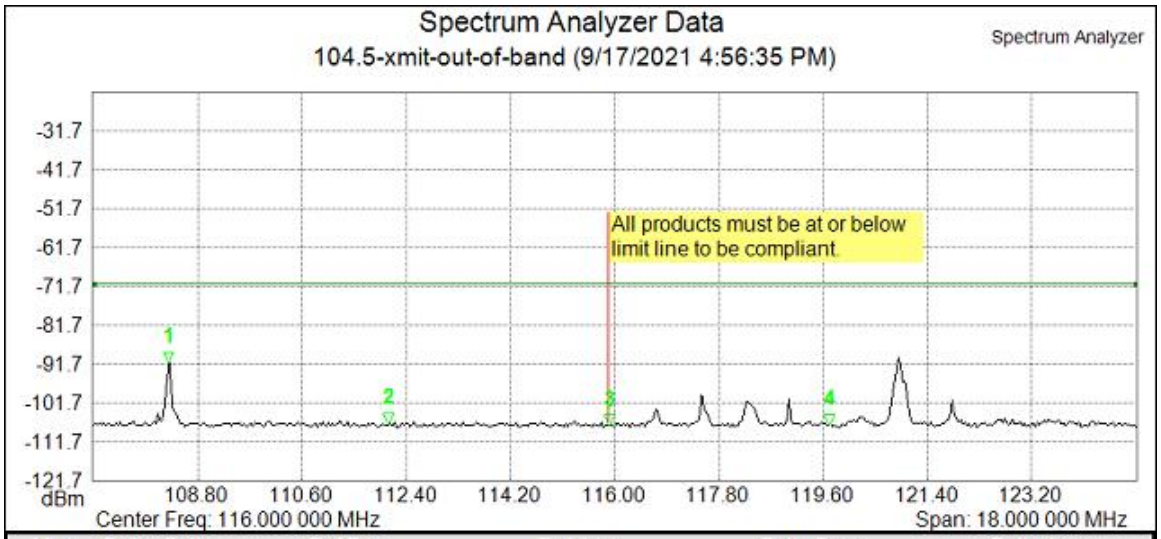


BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213

Out-of-band Intermodulation Products of 104.5 Transmitter



Mkr	Ref	Delta	Ref Freq	Ref Amp	Delta Freq	Delta Amp
1	■	□	108.300 0 MHz	-91.23 dBm	--	--
2	■	□	112.100 0 MHz	-107.13 dBm	--	--
3	■	□	115.900 0 MHz	-107.50 dBm	--	--
4	■	□	119.700 0 MHz	-107.46 dBm	--	--
5	□	□	--	--	--	--
6	□	□	--	--	--	--

BROADCAST COMMUNICATIONS ENGINEERING

Bob Moore
23118 PARADISE DRIVE
LEBANON, MO. 65536

Telephone 417-718-5213

To Whom It May Concern:

Station K264CY, 100.7 MHz

Occupied Bandwidth Study	PASSED
Harmonic Content Study	PASSED
Intermodulation Study	PASSED

Station K283CI, 104.5 MHz

Intermodulation Study	PASSED
Harmonic Content Study	PASSED
Intermodulation Study	PASSED

It is my finding that FM translators K264CY, 100.7 MHz and K283CI, 104.5 MHz are compliant with all requirements of CFR sections 73.317 and 73.1590 of the FCC's Rules and Regulations

Bob Moore

Broadcast Communications Engineering
Lebanon, MO